GUIDELINES FOR USE OF CHLORINE, SULPHUR DIOXIDE AND AMMONIA IN WATER AND SEWAGE TREATMENT WORKS IN THE PROVINCE OF ONTARIO

FEBRUARY 1987

ISSUE No. 1

Ontario
Ministry of the Environment

The Honourable
Jim Bradley
Minister

Rod McLeod
Deputy Minister

GUIDELINES

FOR USE OF

CHLORINE, SULPHUR DIOXIDE AND AMMONIA

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IN THE

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MINISTRY OF THE ENVIRONMENT

CONSULTING AND VALUE ENGINEERING SERVICES
ENVIRONMENTAL APPROVALS AND LAND USE PLANNING BRANCH

MOE GUIDELINES FOR USE OF CHLORINE SULPHUR DIOXIDE, AND AMMONIA

Guidelines for the use of chlorine, sulphur dioxide, and ammonia in both liquid (pressurized) and gaseous state.

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MOE GUIDELINES FOR USE OF CHLORINE, SULPHUR DIOXIDE, AND AMMONIA

Guidelines for the use of chlorine, sulphur dioxide, and ammonia in both liquid (pressurized) and gaseous state.

0.0 PURPOSE OF THE GUIDELINES

The primary intention of these guidelines is to promote the safety of plant operator personnel. Any equipment specified or recommended is presently available.

These guidelines apply to MOE operated facilities only, and specify minimum requirements for all new construction, and are to be incorporated into all re-construction of existing facilities. They comply with and supplement the Engineering Data Sheets Nos. 4-04 and 4-05 issued by the Ministry of Labour, Industrial Health and Safety Branch, regulating the storage and use of Ammonia and Chlorine gases. Design, engineering, construction, and the supply and installation of equipment for MOE operated facilities must comply with these guidelines.

0.1 CATEGORIES

Plants are divided into three basic categories as follows:

Category 1 - Plants using 68 kg (150 lb) cylinders, at an average rate up to 91 kg/d (200 lb/d).

Category 2 - Plants using 1 Mg (1 ton) cylinders in gaseous phase only, at an average rate up to 227 kg/d (500 lb/d).

Category 3 - Plants using 1 Mg (1 ton) cylinders or railroad tank cars in liquid phase through liquid evaporators at an average rate over 227 kg/d (500 lb/day).

See 10.7 Chlorine Usage Chart for typical plant flows.

The application of these guidelines to plant categories is as follows:

Category No.	Applicable Guideline Sections
1	1 through 8.1, 8.4, 9.1, 9.2
2	1 through 7, 8.2, 8.4, 9.1, 9.3
3	1 through 7, 8.2, 8.3, 8.4, 9.1, 9.3, 9.4 (if required)

0.2 DEFINITION OF AREAS INVOLVED

1. Gas Dispenser Area - Contains chemical feeders, and related equipment.

2. Scale Area - Contains scales for weighing cylinders and evaporators, if used.

3. Storage Area - For storage of full and empty chemical cylinders.

4. Entry Vestibule - The location for the eyewash fountain and an emergency self-contained breathing apparatus.

Note

Combining of areas 1, 2, and 3 is normal practice in Category 1 plants.

Combining of areas 2 and 3 is normal practice in Category 2 plants.

(Do not combine areas in Category 3 plants.)

1.0 - BASIC BUILDING REQUIREMENTS

1.1 - Location and Size

a) Construct room above grade at ground level, and locate as close as possible to the gas use point.

b) Arrange room(s) to have two external walls.

c) Locate floor mounted equipment with not less than 0.9 m (36 in.) clearance on all sides.

d) Locate wall mounted equipment not less than 0.6 m (24 in.) from a corner and not more than 1.8 m (6 ft) above floor level.

e) If storage area is unheated, provide space in scale room for a minimum 24-hour supply of replacement cylinders.

1.2 - Floor, Walls, and Ceilings

a) Use only fire resistant material for construction.

b) Provide floor of concrete sloped toward door or drain at 1% grade.

c) Provide gas impermeable ceilings, eg., precast concrete. Do not use suspended ceilings.

d) Seal floor and ceiling joints gas tight from the rest of the building.

e) Seal and paint all interior walls with corrosion or chemical resistant finish.

1.3 - Windows

a) For natural light, locate sill 1.5 m (60 in.) above floor.

b) Provide observation windows - from gas-free area giving maximum view of chemical weighing and feed area of not less than 1.2 m (47 in.) wide and 0.9 m (36 in.) height with a sill 1.1 m (42 in.) above floor.

c) Construct sash of steel, fixed type, glaze with 6 mm (¼ in.) plate glass, seal gas tight.

d) Seal sash gas tight in masonry opening.

1.4 - Doors

a) Provide doors on external walls only - direct access to the rest of the building is not permitted.

b) Provide two or more doors if distance to be travelled to exit is over 4.5 m (15 ft). Do not exceed a distance of 7.6 m (25 ft) to an exit.

c) Hinge doors to swing outward and equip with bar type panic-hardware, and self closer. Locate the catch side toward the normal access route.

d) Provide each area (e.g., storage, weighing, evaporating, gas feeding) with a separate door to the outside.

e) Provide gas-tight inter-connecting doors between areas.

f) Provide all doors of hollow steel or kalamine construction with flush thresholds.

g) Post "Danger (Chlorine) (Sulphur Dioxide) (Ammonia) Storage" signs on wall at latch side of door, directly over wall switches.

1.5 - Floor Drains

a) Floor drains can be provided in large plants.

b) Floor drains are required if the following equipment is installed:

- Hydraulic operated shut-off or pressure reducing valves on evaporators.
- Vacuum check valve drains on injectors with gas consumption over 1 Mg/d (2,200 lb/d).
- Residual analyzer located in the feed room.
- Evaporators which are required on gas feeders of over 1 Mg/d (2,200 lb/d) capacity.

c) Construct of corrosion-resistant material.

d) Provide a dripped trap at each drain.

e) In water and waste water treatment plants, discharge drain to a sewer or drainage system separate from that employed by the rest of the plant.

1.6 - Weigh Scale

a) A recess in the floor is NOT required:

- for a scale weighing ton containers;

- for a scale weighing 68 kg cylinders if it has a low profile platform (i.e., up to 38 mm in height).

b) Provide a recess in the floor, when required for a scale weighing 68 kg cylinders, with the following features:

- equipped with a structural steel angle frame, flush with the floor, to reinforce the edge of the recess;
- sized to accommodate the platform of the scale; extend the recess at the rear (scale column) end 200 mm approximately, for the full width of the platform, to form a "swab trough"; slope the recess towards the trough; cover the trough with a removable 6 mm aluminum floor plate flush with the floor.

2.0 - ELECTRICAL

2.1 - General

a) Locate only the basic controls essential to operation, heating, lighting, and ventilation in the chemical rooms. Chlorine and sulphur dioxide installations are not hazardous locations according to the Canadian Electrical Code; however, the gases are toxic and very corrosive. An ammonia installation is hazardous, see Section 8.4 f) for the electrical requirements.

b) Use only motors of the totally enclosed type. (TEFC or explosion proof).

c) Install conduit with the minimum restriction of access for servicing of equipment.

d) Connect all chemical room circuits to emergency power panel.

2.2 - Lighting - Gas Dispenser Room

a) Provide adequate lighting for safe working conditions at operation and service areas (including behind the gas dispenser). Minimum light intensity 540 lux.

b) Provide 1.2 m fluorescent fixtures, surface or suspended type, industrial type vapour proof.

c) Connect to the emergency generating set circuit OR provide an emergency lighting unit. Minimum two 25W lamps and 30 AH battery.

d) Provide an outside light over the entrance/exit door(s).

2.3 - Light and Fan Switches - Gas Dispenser and Scale Room

a) Locate all switches outside the gas dispenser room and entry vestibule.

b) For the room lighting provide two-way switches, one beside the observation window and one at the exit door.

c) For the emergency ventilating fan provide two-way switches adjacent to the light switches.

d) For the normal ventilation fan, provide a switch at the observation window.

e) The switches on the outside of the wall by the exit door should be weatherproof and within .6 m of the latch side of the door.

f) NOTE - If the gas dispenser room has more than one door, provide switches for the fan and lights at each door.

g) Identify the switches clearly.

h) The outside light over the door(s) may be turned on with other outside lights.

2.4 - Conduit and Fittings - Gas Dispenser and Scale Room

a) Provide rigid PVC OR rigid steel, epoxy coated conduit. Equal to "Scepter" or "Conacote".

b) Surface mount the conduit clear of possible damage by chemical cylinders or provide additional metal protection.

c) Arrange for direct connection to the load except for the gas dispenser. Use flexible liquid tight conduit where necessary.

d) Seal all conduits passing to and from the gas dispensing and and scale rooms using "EYS" or "GUA" seal fittings filled with a sealing compound approved by Ontario Hydro.

e) Provide a weatherproof duplex receptacle on the wall close to the gas dispenser for the inlet block heater OR provide direct connection of the heater circuit on to the inlet block heater.

3.0 - HEATING

.1 Provide electric unit heaters in the gas dispenser and storage rooms OR hot water convectors. Do NOT provide open flame heaters or hot air from a central system. Size the heater to maintain the room temperature at a minimum of 15°C.

.2 The unit heaters are usually 575 V, 3 Ph with wall mounting bracket and built-in fan, magnetic contactor, control circuit transformer and thermostat. If one unit only is required, 5 kW is the recommended minimum rating (equal to "Chromalox" BUH).

.3 Locate unit heater on the wall over 1.8 m above the floor and close to the outside corner if only one unit is required and a minimum distance of 3 m from chemical cylinders.

.4 Install heaters with the minimum restriction of access for servicing of equipment.

4.0 - ROOM VENTILATION

.1 Provide emergency and normal ventilation in the gas dispenser and scale rooms as follows:

a) Emergency exhaust fan to produce 30 air changes per hour.

b) Normal exhaust fan to produce three air changes per hour OR natural ventilation together with a gas leak detector.

c) Locate discharge of fans a minimum of 1.8 m (6 ft) from building openings, air intakes, walkways, etc., and a minimum of 5 m (16 ft) from dry wells, wet wells, manholes, etc.

d) If more than one fan is required, do not connect discharges into a common duct.

e) Install each exhaust fan with only one air inlet duct, extended to within 450 mm of the floor.

f) Locate inlet and exhaust openings on separate walls with a minimum of 2.5 m (8 ft) horizontal separation.

.2 Inlet Openings

a) For emergency ventilation provide an opening with a fixed storm louvre on the outside and a motorized louvre on the inside. Provide an insect screen between the louvres. Size the opening of the louvre based on .1 m^2 of free opening per 14 m^3 of fan rating. Minimum size

of free opening to be .1 m^2. The motorized louvre shall open when the emergency fan runs.

b) For normal ventilation provide an opening in the roof, with ductwork extending to within .5 m of floor, or outside wall commencing 150 mm above the floor. Size the opening on the basis of 0.1 m^2 of free opening per each 50 m^2 of floor space. Assume 50% obstruction for screen and louvres. The frame opening to be not less than 0.1 m^2 and not to exceed 600 mm x 750 mm approximately. Provide rain cover or louvres and insect screen.

c) Locate the openings so that cold draughts will not strike the equipment or piping.

.3 Exhaust Opening for Emergency Ventilation

a) Provide an opening for the emergency fan with an accessible gravity louvre on the inside wall.

b) If the emergency fan is inside the room, provide a fixed weatherproof louvre at the outside of the opening.

c) Locate the opening on the outside wall over 1.8 m above the floor at least 2.5 m above grade, away from air intakes and near the corner furthest from the single door.

d) Arrange to give the maximum cross ventilation and prevent short circuiting.

e) Size the opening to suit the capacity of the fan as per clause 4.1(a), or larger.

.4 Exhaust Opening for Normal Ventilation

a) Provide an opening for the normal ventilating fan OR provide brick or block vents in the outside wall for natural ventilation. (Equal to "Construction Specialities".)

b) Locate the exhaust opening(s) over 1.8 m above the floor, a minimum of 2.5 m above grade, and at least 1.5 m from the emergency exhaust opening.

c) Provide an outside grille for the fan opening.

d) Size the natural exhaust ventilation opening the same size as for the inlet opening.

.5 Emergency Exhaust Fan

a) Provide a centrifugal wall exhauster on the outside walls, preferably over 1.8 m above the floor, and at least 2.5 m above grade.

- If the fan is located outside, provide the unit in a weatherproof enclosure.

- If the fan is located inside, provide a single inlet self-contained assembly.

b) Provide the direct driven centrifugal fan with a totally enclosed motor. The fan should have a minimum static pressure of 13 mm water column at

the required air flow. The motor should be rated 120 V, 1 phase, minimum capacity of 0.17 kW and a maximum speed of 1800 rpm. NOTE - Two-speed fans are not normally recommended because of the limited availability of a replacement motor.

c) Extend the suction air duct from the fan down to within 450 mm of the floor.

d) Control the fan by two-way switches outside the gas dispenser room, one by the exit door and one by the observation window. The fan is also controlled via the gas detector with manual override if natural ventilation is provided.

.6 Normal Ventilation Fan - If Required

a) Provide a wall mounted propeller type fan over 1.8 m above the floor inside the room and at least 2.5 m above grade. NOTE - A centrifugal room exhauster of suitable capacity located outside the room may be used.

b) Direct drive the fan by a totally enclosed motor, rated 120 V., 1 phase, minimum of .06 KW.

c) Locate the fan control switch outside the gas dispenser room by the observation window. The fan is to run continuously.

d) Extend the inlet duct to within 250 mm of the floor.

5.0 - EQUIPMENT VENTING

.1 Vent the following equipment using separate lines

Remote vacuum regulators;
Gas Dispensers;
Gas pressure reducing valves;
Evaporators;

.2 Multiple feeders using identical gas may be vented to a common header provided vent pipe area is equal to the sum of the vent pipe areas from the feeders.

.3 Provide vent lines of PVC pipe or plastic tubing - size and type as specified by the equipment supplier.

.4 Slope continuously from a high point above equipment to point of atmospheric discharge to eliminate any moisture traps.

.5 Construct discharges of vents as follows:

- Terminate by a 90° elbow facing downward
- Covered by corrosion-resistant insect screen;
- A minimum of 2.5 m (8 ft) above grade;
- Located as per "room ventilation" (4.1(c)).
- If different gases, separate by a minimum of 2.5m (8 ft) horizontally.

.6 Connect individual vents to top of header to prevent trapping of moisture.

6.0 - PIPING - CHEMICAL

6.1 - General

Locate all piping to give unobstructed access to the equipment.

For pressurized liquid or gaseous chemicals:

a) Provide schedule 80 seamless iron or steel, minimum acceptable diameter 20 mm (3/4 in.).

b) Provide pipe fittings, class 13,800 kPa (2,000 psi).

c) Provide unions of 6,900 kPa (1,000 psi) ammonia type - 2 bolt oval or 4 bolt square flanged type. Use as few as possible.

d) Use lead or asbestos gaskets.

e) Provide minimum number of 13,800 kPa (2,000 psi) ammonia type valves for in-line use.

f) Do not use reducing bushings - use reducing couplings as required.

g) Slope horizontal runs towards cylinders at a minimum of 1% grade.

h) Provide threaded pipe with:

- sharp, unbroken threads;
- burrs removed from inside;
- metal cuttings and oils removed before assembly;

(use perchlorethelene, trichlorethelene or other solvents approved by the Chlorine Institute, do not use hydrocarbon or ammonia based cleaners);
- litharge and glycerine, linseed oil and white lead or teflon tape as a joint sealant. Do not use petroleum based solvents.

i) Provide approved type flexible cadmium plated copper tubing (1.24 mm wall thickness) with a 250 mm (10 in.) vertical loop, auxiliary valves and captive yoke-type clamps between cylinders and valves on header. Use only lead, asbestos or other gaskets approved by the Chlorine Institute.

j) Replace flexible tubing annually.

k) Test all pressure piping with dry air (dew point - 40°C) or nitrogen at 2,068 kPa (300 psi) for 48 hours after installation is completed. Hydrostatic testing is not acceptable.

l) Replace header and pressure piping every five years.

m) Ensure that vapourizers, evaporators, and pressure piping comply with the Boilers and Pressure Vessels Act.

6.2 - Chemical Piping - Gas Phase Only

a) On vertical pipe runs, provide a 300 mm (12 in.) capped nipple at the bottom of each run as drip pockets.

b) Protect from direct draft of cold air from ventilation air inlet.

c) Provide 150 mm (6 in.) stand-off brackets if piping is to be mounted on the inside of an external wall.

d) Provide a suitable diaphragm protected gauge, located so that it is easily viewed from the scale platform. Install on low pressure side if pressure reducing valve is used.

e) If a pressure reducing or a vacuum regulating valve is used, locate as close as possible to the cylinder header.

6.3 - Piping - Chemical Solution

a) Provide corrosion resistant material (e.g., rigid PVC pipe and inert plastic tubing).

b) Provide corrosion resistant valving in solution lines, e.g.,

   a) rubber lined diaphragm;
   b) plastic ball type.

c) Locate injectors as close as possible to application point to minimize length of solutions lines.

7.0 - EQUIPMENT REQUIREMENTS (GENERAL)

.1 Provide an appropriate gas leak detector and alarm device to be in continuous operation in all scale and feed areas. Discharge sample air, if piped to detector, back to area or direct to outside atmosphere.

.2 Provide an eye wash fountain, preferably in a heated area, within 4.5 m of an exit from, but not in the area of possible contamination. If in an unheated area, provide a water supply valve with a drain-down feature installed below frost level.

.3 Provide a self-contained breathing apparatus of at least 30-minute duration, pressure demand type, with spare cylinder(s), to be located as in 7:2. A 15-minute unit may be used for egress only, but not to enter a room with a known gas leak.

.4 Provide protective goggles, aprons, rubber gloves, rubber slickers and safety footwear for persons loading, storing or handling chemicals.

.5 Provide all appropriate pressure and vacuum gauges.

.6 Ensure that heaters, if provided on gas feed equipment, are on at all times during operation of feed equipment.

.7 Locate injectors remotely from the room whenever possible.

.8 Use a gas pressure reducing valve close to cylinders when pressure lines must pass into another room.

.9 Provide a gas repair tool kit, as recommended by the supplier.

NOTE - Locate items 2 and 3, if practicable, in pressurized entry vestibule.

8.0 - ADDITIONAL EQUIPMENT REQUIREMENTS

8.1 - Category 1 Plants

Using 68 kg (150 lb) cylinders gaseous feed to 91 kg/d (200 lb/d):

a) Provide scales of the "Low Profile" with platform 50 mm (2 in.) maximum above floor or platform type recessed into floor to put platform at floor level. Scale may be of beam or dial type. See clause 1.6.

b) Supply support bracket and chains at 2/3 of cylinder height for each cylinder.

c) Provide a three or four wheeled hand cart, with safety chain or strap, for moving cylinders.

8.2 - Category 2 Plants

Using 1 Mg (1 ton) containers gaseous feed to 227 kg/d (500 lb/d):

a) Provide separate rooms for scales and feed equipment.

b) Supply a minimum room height of 3.7 m (12 ft) above scale platform.

c) Provide only platform type scales. See clause 1.6.

d) Supply track, hoist, and lifting bar, minimum capacity of 2 Mg (2 ton).

e) Supply rollers on scale platform for cradle to allow rotation for valve alignment.

8.3 Category 3 Plants

Using 1 Mg (1 ton) containers or tank cars in liquid phase through evaporators:

a) Liquid feed lines - container to evaporator

- not to have drip traps;
- to be as short as possible;
- to have minimum number of in-line valves and unions.

b) Where liquid chemical can be trapped between valves, supply the following:

- rupture disc;
- diaphragm protected alarm switch;
- expansion chamber of suitable size to protect piping involved.

c) With systems using evaporators, use only one supply cylinder at any given time.

d) Liquid evaporators:

- locate in scale room or area protected from feed room, easily viewed from scale platform;
- fit with cathodic protection against corrosion;
- vent separately from feeders or control valves;
- locate where lifting gear can be used for cleaning and inspection of inner vessel.

e) All vessels containing liquid and/or gaseous chemicals are subject to inspection in accordance with the Boiler and Pressure Vessels Act.

8.4 - Ammonia Installations

Open flames or welding are prohibited in the vicinity of storage tanks or piping.

Provide the following:

a) An explosion relief to the outdoors, with an area of 0.1 m^2 per 1.42 m^3 of building volume. Glass windows of standard glass scored diagonally on the outside is acceptable.

b) An easily accessible deluge shower with quick opening valve in addition to an eyewash fountain in a heated area.

c) Portable fire extinguishers.

d) Hot water convectors for room heating.

e) One ammonia type first-aid kit.

f) Electrical wiring and equipment to Class 1, Group B requirements of the Canadian Electrical Code.

g) One fire hydrant fitted with 64 mm hose in the ammonia storage area.

h) Ground all cylinders, piping, and other equipment by the methods described in the Engineering Data Sheet No. 10-0 issued by the Ministry of Labour, Industrial Health and Safety Branch.

i) Exhaust for inlet duct located at ceiling level. (Ammonia gas is lighter than air).

9.0 - CHEMICAL STORAGE

9.1 - All Cylinders

a) Store full and empty cylinders in separate groups, with protection cap over valves.

b) Cylinder shall not be stored:

- near combustible liquids (e.g., gasoline, oil)
- near any type of inflammable material
- on uneven, wet, or debris-covered floors
- near other compressed gasses, (e.g., air, oxygen, acetylene, nitrogen, etc.)
- near inlets of ventilating or air conditioning systems
- near elevator shafts, wells, and dry wells, manholes, stairwells, etc.
- near any source of heat, such as furnace, radiator, heating elements
- in direct sunlight in outside storage areas

9.2 - 68 kg (150 lb) Cylinders

a) Provide each cylinder with a safety chain at 2/3 of cylinder height for both full and empty cylinders.

b) Do not store full cylinders against an outside wall.

c) Store cylinders in an upright position.

9.3 - 1 Mg (1 ton) Cylinders

a) Store cylinders on level racks 150 mm (6 in.) minimum above floor level.

b) Use permanent wedges, blocks, or cradles to prevent rolling of cylinders.

c) "Stacking" of cylinder is not permitted.

9.4 - Railroad Chemical Tank Cars

.1 Store tank cars on a dead end, level track, private siding.

.2 Chemical sidings shall be located at least:

a) 600 m (2,000 ft) from public buildings and areas of public congestion.

b) 300 m (1,000 ft) from private residences.

c) 23 m (75 ft) from storage or transfer facility for a combustible or dangerous commodity.

d) 15 m (50 ft) from an adjoining property or from the curb line of a main roadway or street.

.3 Protect tank car by locked de-rail device, or a closed locked switch, or both.

.4 Locate de-rail device a minimum of one car length away from tank car on the open end of the track.

.5 a) The area shall be well and clearly posted "DANGER! - CHLORINE!, SULPHUR DIOXIDE! OR AMMONIA!" as appropriate.

b) Place caution signs on the track on open end and leave up until tank car is unloaded and disconnected from discharge connection. Signs

should be of metal or any other suitable material, at least 300 mm x 400 mm (12 in. x 15 in.) in size and bear the words "Stop, Tank Car Connected" or "Stop, Men at Work". The word "Stop" being in letters at least 100 mm (4 in.) high and the other words at least 50 mm (2 in.) high. The letters should be white on a blue background.

.6 Set brakes and block wheels on all cars being unloaded.

.7 Provide a suitable operating platform at unloading point for easy access to the protective housing, for the connecting of flexible lines and valve operation.

.8 Provide area lighting at tank car location for unloading at night and hang a blue lantern on the stop sign.

.9 Before unloading, verify contents of car by comparing car numbers and letters with shipping papers.

.10 Provide a flexible connection between car and building with the loop connected in such a manner that the top of the loop is above the connections.

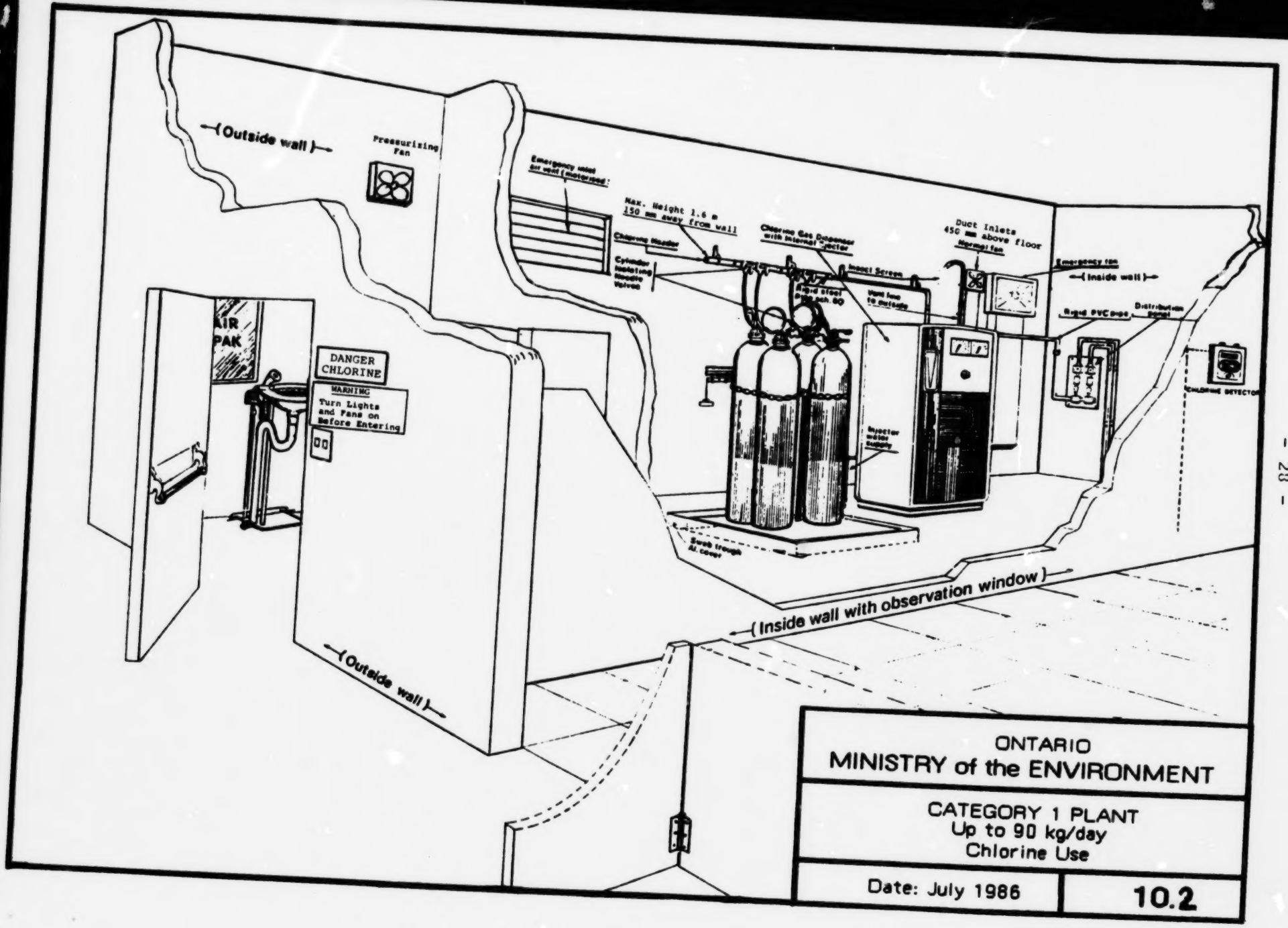
.11 Renew the flexible connection annually.

.12 Provide only qualified personnel to perform the connecting and unloading of any chemical containers.

10.0 - TYPICAL LAYOUTS

10.1 - Legend

1. Light, Fan Switches
2. Panic Bar Hardware
3. Eyewash Fountain
4. Self-Contained Breathing Apparatus and Spare Air Cylinder(s)
5. Gas Injector (if required in room)
6. Solution Distribution Panel (if required in room)
7. Scales
8. Gas Dispenser
9. Gas Detector
10. Normal Ventilation Fan
11. Emergency Exhaust Fan
12. Air Inlet
13. Full Cylinder Storage
14. Empty Cylinder Storage
15. Viewing Window(s)
16. Safety Staunchion, Protecting Scales
17. Manifold on Scale Head
18. Evaporator
19. Gas Pressure Reducing Valve.
20. Remote Vacuum Valve.



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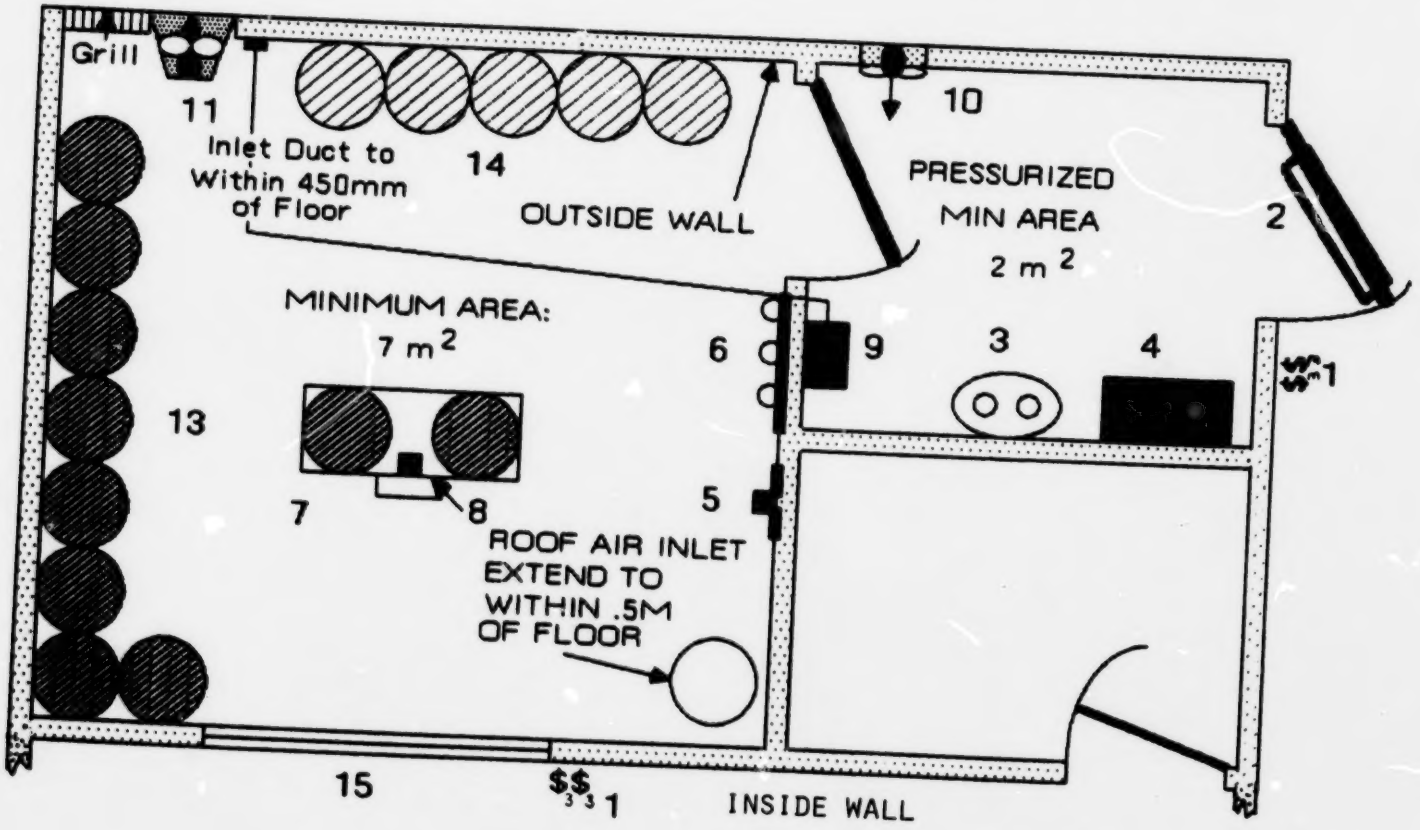
CATEGORY 1 PLANT
Up to 90 kg/day
Chlorine Use

Date: July 1986

10.2



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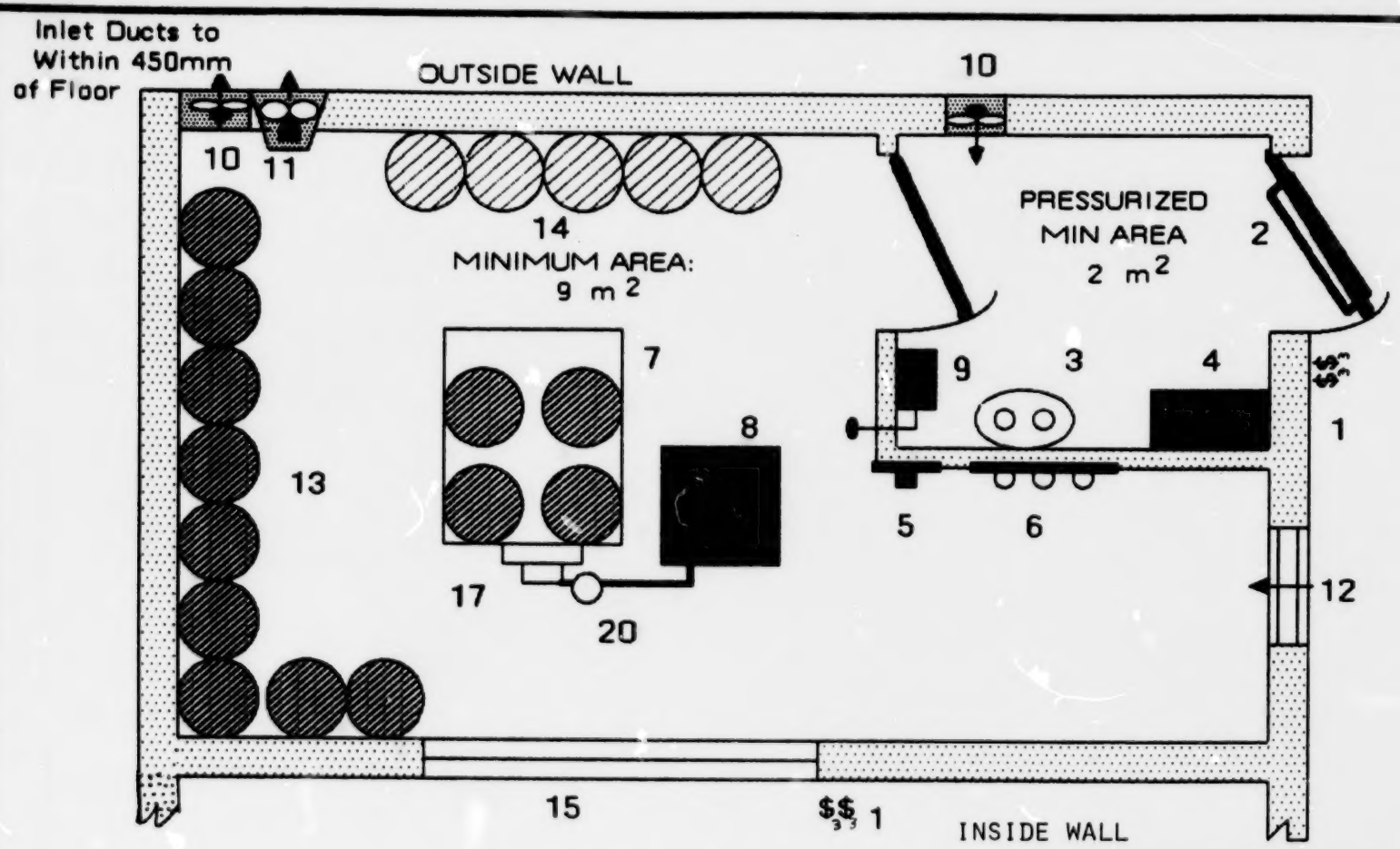
CATEGORY 1 PLANT
Up to 50 kg/day
Chlorine Use

Date: July 1986

10.3



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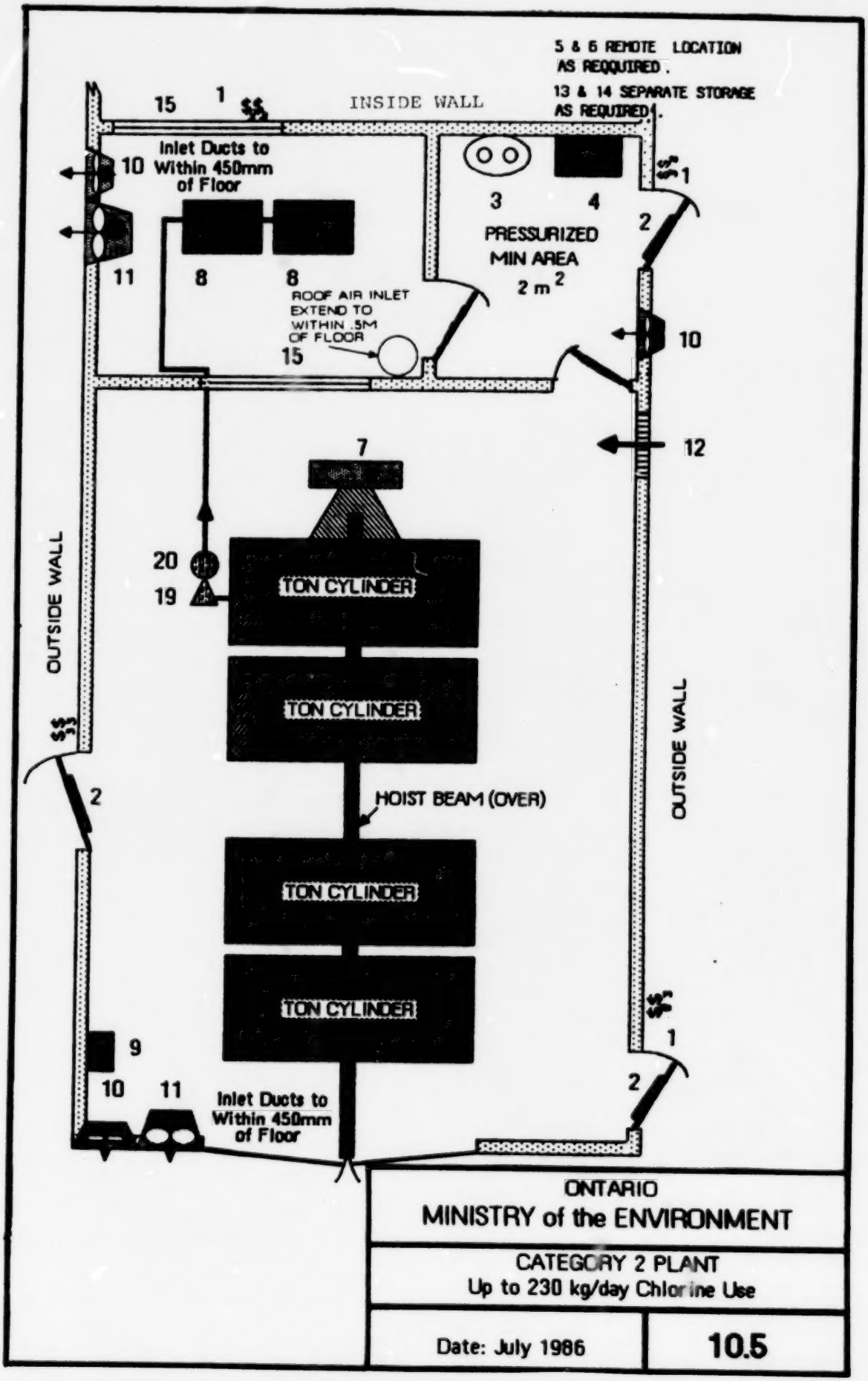
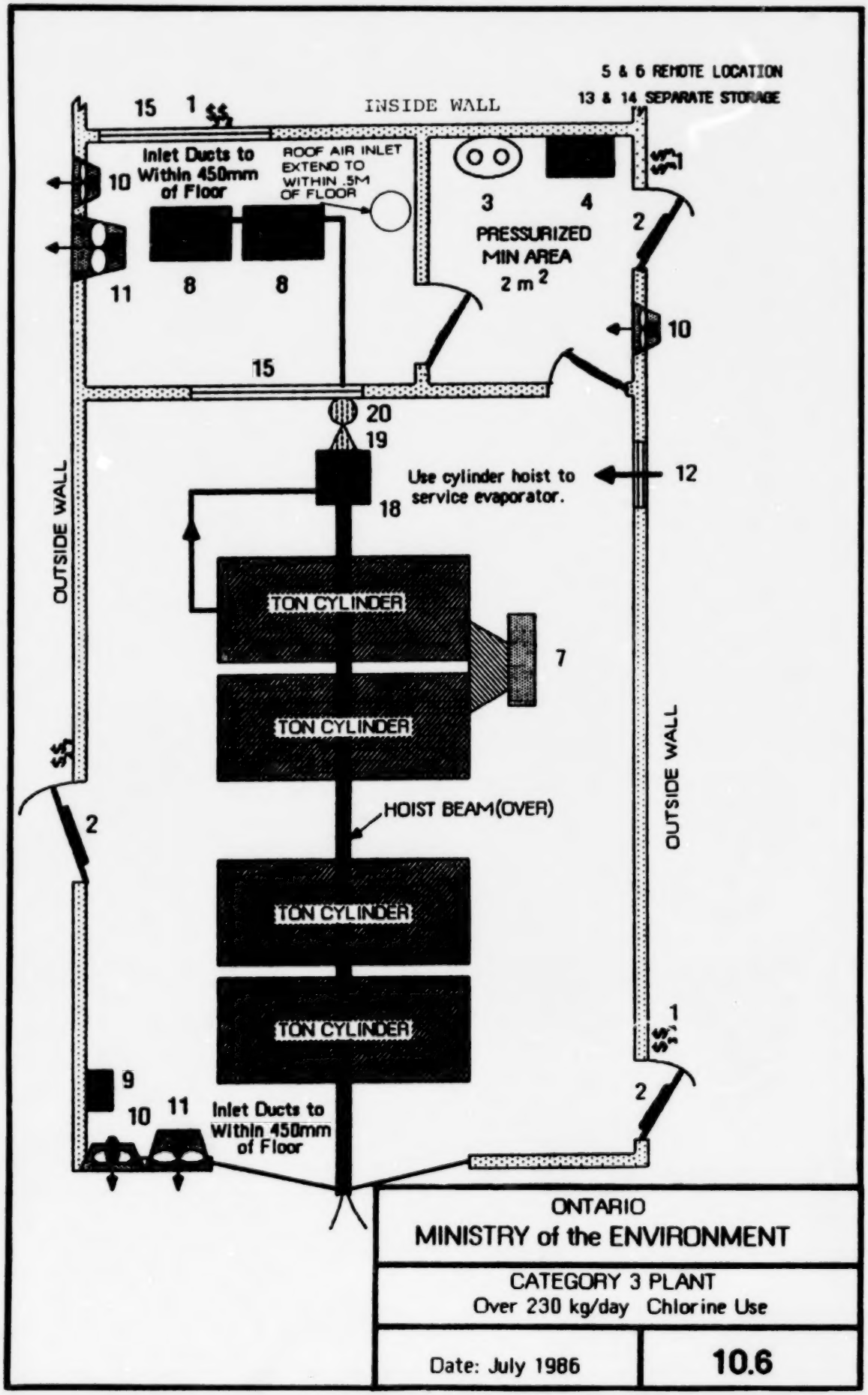
CATEGORY 1 PLANT
Up to 90 kg/day
Chlorine Use

Date: July 1986

10.4


5 & 6 REMOTE LOCATION AS REQQUIRED.
13 & 14 SEPARATE STORAGE AS REQUIRED.
INSIDE WALL
15
1
Inlet Ducts to Within 450mm of Floor
10
11
8
8
3
4
PRESSURIZED MIN AREA 2 m 2
ROOF AIR INLET EXTEND TO WITHIN .5M OF FLOOR
15
2
10
12
7
20
19
TON CYLINDER
TON CYLINDER
HOIST BEAM (OVER)
TON CYLINDER
TON CYLINDER
OUTSIDE WALL
OUTSIDE WALL
2
9
10
11
Inlet Ducts to Within 450mm of Floor
1
2
ONTARIO
MINISTRY of the ENVIRONMENT
CATEGORY 2 PLANT
Up to 230 kg/day Chlorine Use
Date: July 1986
10.5


5 & 6 REMOTE LOCATION
13 & 14 SEPARATE STORAGE
INSIDE WALL
15
1
Inlet Ducts to Within 450mm of Floor
ROOF AIR INLET EXTEND TO WITHIN .5M OF FLOOR
10
11
8
8
3
4
PRESSURIZED MIN AREA 2 m²
2
10
15
20
19
Use cylinder hoist to service evaporator.
12
18
OUTSIDE WALL
TON CYLINDER
7
TON CYLINDER
HOIST BEAM(OVER)
2
TON CYLINDER
TON CYLINDER
OUTSIDE WALL
1
2
9
10
11
Inlet Ducts to Within 450mm of Floor
ONTARIO
MINISTRY of the ENVIRONMENT
CATEGORY 3 PLANT
Over 230 kg/day Chlorine Use
Date: July 1986
10.6

10.7 Chlorine Usage Chart

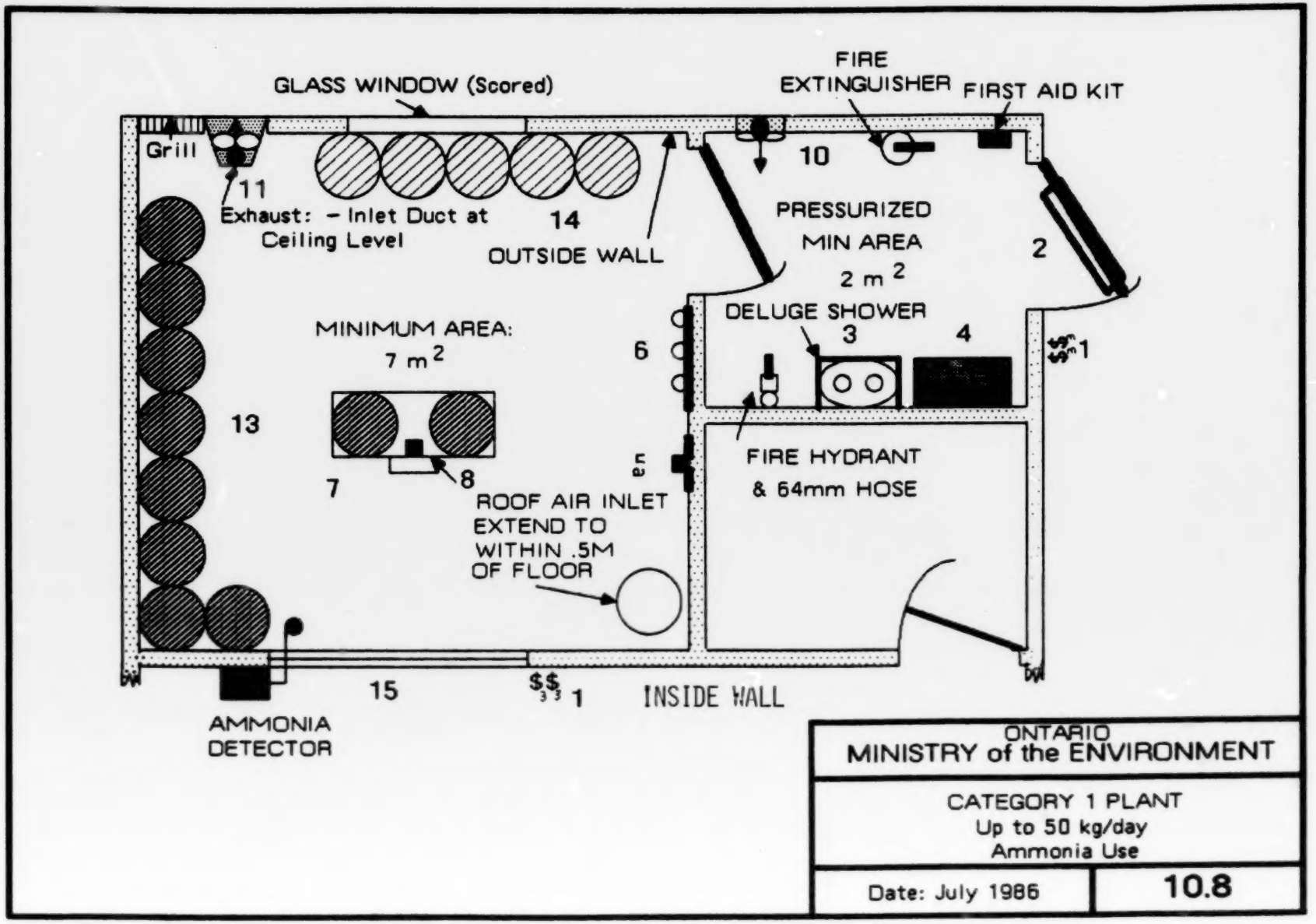
Typical Plant Capacities

Maximum Chlorine Use kg / 24 hrs	Inventory of Chlorine Containers			Peak Flow Total Suppy: Days	Sewage Treatment Plant Peak Flow m3/d		Water Treatment Plant Max. Day Flow m3/d	
	In Service (On Scale)	In Reserve (Warmed Up)	In Storage (Indoors)		Dosage: mg/l		Dosage: mg/l	
					5	10	2	4
5	2–68 kg cyls	2–68 kg cyls	–	53	1000	500	2500	1250
20	2–68 kg cyls	4–68 kg cyls	4–68 kg cyls	34	4000	2000	10000	5000
50	4–68 kg cyls	4–68 kg cyls	10–15 68 kg cyls	25–31	10000	5000	25000	12500
100	2–ton Containers	1–ton Container	1–ton Container	40	20000	10000	50000	25000
200	2–ton Containers	1–ton Container	3–ton Containers	30	40000	20000	100000	50000
500	4–ton Containers	2–ton Containers	7–9 ton Cont.	24–28	100000	50000	250000	125000
750	4–ton Containers	4–ton Containers	10–15 ton Cont.	23–30	150000	75000	375000	187500
1000	3–ton Containers with Evaporator	4–ton Containers	14–ton Containers & 1 Rail Car	37	200000	100000	500000	250000

MAXIMUM SUSTAINED GAS
WITHDRAWAL RATE IN KG PER DAY @21 C

GAS	Size of Container	
	68 kg	1 Ton
Chlorine	25	200
Sulphur Dioxide	30	300
Ammonia	35	–

TBH 12/85


GLASS WINDOW (Scored)
FIRE EXTINGUISHER
FIRST AID KIT
Grill
11
Exhaust: – Inlet Duct at Ceiling Level
14
OUTSIDE WALL
10
PRESSURIZED MIN AREA 2 m 2
2
DELUGE SHOWER
3
4
1
MINIMUM AREA: 7 m 2
6
13
7
8
FIRE HYDRANT & 64mm HOSE
ROOF AIR INLET EXTEND TO WITHIN .5M OF FLOOR
15
1
INSIDE WALL
AMMONIA DETECTOR
ONTARIO
MINISTRY of the ENVIRONMENT
CATEGORY 1 PLANT
Up to 50 kg/day
Ammonia Use
Date: July 1986
10.8